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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/821,790 | 04/09/2004 | Yu-Chong Tai | 020859-003210US | 9332 |

20350 7590 08/29/2007

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| EXAMINER | |
|---|---|
| SUNG, CHRISTINE | |
| **ART UNIT** | **PAPER NUMBER** |
| 2884 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 08/29/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/821,790 | TAI ET AL. | |
| | Examiner | Art Unit | |
| | Christine Sung | 2884 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *25 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

### *Response to Amendment*

1. The amendment filed on June 25, 2007 has been accepted and entered.

2. The request for continued examination filed on June 25, 2007 has been accepted and entered.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-5, 8-14, 17-21 and 23-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Faraone (US Pre Grant Publication 2005/0226281 A1).

Regarding claim 1, Faraone discloses an integrated sensing apparatus for electromagnetic radiation (Figure 3B), the sensing apparatus comprising:

A substrate (element 27) comprising a backside (side facing element 15) and a face (side facing element 13), the substrate transparent to incident electromagnetic radiation of a wavelength (the radiation, element 24'i', traverses the substrate to be detected by element 13, the IR sensitive layer, thus it is inherent that the substrate must be transparent to incident radiation),

A tunable cavity region (element 11") coupled to the backside of the substrate (see figure 3b, tunable cavity is coupled to the backside of substrate) and configured to receive the incident electromagnetic radiation transmitted through the substrate (see element 24 'i');

An elastic material forming a region including the tunable cavity region (element 25 is a polymer, polyimide, a well known flexible material);

A first reflection device (element 19) within a first portion of the tunable cavity region (element 11")

A second reflection device (element 15) within a second portion the cavity region and facing the first reflection device (see figure 3B, elements 19 and 15 face each other);

a movable gap (element 21) formed between the first reflection device and the second reflection device within the tunable cavity region (see figure 2A, tunable cavity is moveable to change the distance d);

an actuation device (Figure 2A, element 23) coupled to the tunable cavity region, the actuation device being adapted to cause movement from a first predetermined spatial dimension to a second predetermined spatial dimension of the movable gap (element 23 changes the voltage across the electrodes/reflectors and causes an electrostatic force between the electrodes/reflectors- this can be tuned using changes in voltage, see paragraph [0127]);

and a detection device (Figure 3B, element 13, IR sensitive layer) coupled to the tunable cavity.

Regarding claim 2, Faraone discloses that the detection device (Figure 2a, element 13) comprises one of the reflection devices (element 15).

Regarding claim 3, Faraone disclose that the electromagnetic radiation is IR (paragraph [0134]).

Regarding claims 4-5, Faraone discloses that the first predetermined spatial dimension ranges from about 0.9 Microns to about 1.7 Microns (see paragraph [0135], d is between 900-1700 microns, which is 0.9-1.7 microns).

Regarding claims 8-9, Faraone discloses an actuation device (Figure 2A, element 23)that controls the distance which controls the cavity depth, d. Although Faraone does not explicitly state using a drive device and a controller, it is inherent that such elements are required to maintain as well as manipulate the actuation device.

Regarding claim 10, Faraone discloses that the substrate comprises a silicon wafer (paragraph [0007]).

Regarding claim 11, Faraone discloses that the detection device is adapted to capture information associated with a selected wavelength range within an IR range of electromagnetic radiation having the selected wavelength range (paragraph [0134]), the electromagnetic radiation having the selected wavelength range having a resonating characteristic between the first reflection device and the second reflection device within the tunable cavity region (paragraph [0135]).

Regarding claim 12, Faraone discloses that the selected wavelength range is selected from 100-1,000,000 nm (which is equal to 0.1-1000 microns) (see paragraph [0076])

Regarding claim 13, Faraone discloses that the tunable cavity region is free from electromagnetic radiation outside of the selected wavelength range having a resonating characteristic (paragraph [0134], the desired radiation is passed through, while unwanted radiation is reflected back).

Regarding claim 14, Faraone discloses that the movable gap (figure 3A, element 21) is maintained at the second predetermined spatial dimension to provide the resonating characteristic of the electromagnetic radiation between the first reflection device and the second reflection device (paragraph [0134]).

Regarding claim 17, Faraone discloses a method for sensing electromagnetic radiation having a predetermined spatial frequency, the method comprising:

providing a substrate (figure 3B, element 27) transparent to a band of electromagnetic radiation (substrate 27 is made of silicon, which is inherently transparent to IR radiation, further the incident radiation passes through the tunable cavity and through the substrate to be detected by the IR sensitive layer, element 13, thus it is inherent that it is transparent to the incident radiation);

providing a tunable cavity region (element 21), the tunable cavity region comprising an elastic material (element 25, comprises a polyimide, flexible polymer) forming a region including the tunable cavity region,

the tunable cavity region having a first reflection device (element 19) within a first portion of the tunable cavity region and having a second reflection device (element 15) within a second portion the cavity region and facing the first reflection device,

the tunable cavity region having a movable gap (element 21) formed between the first reflection device and the second reflection device within the tunable cavity region (gap 21 is formed by the two reflection pieces, 15 and 19);

receiving the band of electromagnetic radiation(element 24 'i') transmitted through the substrate;

moving the movable gap (figure 2a, element d) from a first predetermined spatial dimension to a second predetermined spatial dimension using an actuation device (element 23) coupled to the tunable cavity region;

causing a resonating characteristic of a selective wavelength corresponding to the band of electromagnetic radiation between the first reflection device and the second reflection device within the tunable cavity while being maintained at the second predetermined spatial dimension(element 23 changes the voltage across the electrodes/reflectors and causes an electrostatic force between the electrodes/reflectors- this can be tuned using changes in voltage, see paragraph [0127]);

preventing one or more wavelengths outside of the selected wavelength from achieving the resonating characteristic (paragraph [0134], the desired radiation passes through, while the unwanted radiation is reflected back) between the first reflection device and the second reflection device while being maintained at the second predetermined spatial dimension;

and capturing information associated with the selected wavelength using a detection device coupled to the tunable cavity region (paragraph [0134]).

Regarding claim 18, Faraone discloses that the detection device (figure 2a, element 13) comprises one of the reflection devices (element 15)

Regarding claim 19, Faraone discloses that electromagnetic radiation is IR (paragraph [0134])

Regarding claims 20-21, Faraone discloses predetermined spatial dimension ranges from about 0.9 Microns to about 1.7 Microns (see paragraph [0135], d is between 900-1700 microns, which is 0.9-1.7 microns).

Regarding claim 23, Faraone discloses that the elastic member is a polymer (polyimide, paragraph [0137]).

Regarding claim 24, Faraone discloses an actuation device (Figure 2A, element 23) that controls the distance which controls the cavity depth, d. Although Faraone does not explicitly state using a drive device, it is inherent that such an element is required to maintain as well as manipulate the actuation device.

Regarding claim 25, Faraone discloses that the selected wavelength range is selected from 3-5 Microns to 8-14 Microns (100-1,000,000 nm (which is equal to 0.1-1000 microns) (see paragraph [0076]).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 6-7 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Faraone (US Pre Grant Publication 2005/0226281 A1).

Regarding claims 6 and 22, Faraone discloses a IR detection device and detection method (see above paragraphs), but does not explicitly specify measure temperature. However, it is well-known that IR detection data is the same data used to determine temperature. Thus, one of ordinary skill in the art would be motivated at the time the invention was made to have used the detected information to determine temperature.

Regarding claim 7, Faraone discloses that the IR sensing device is a sensing device comprises one of the first or second reflection devices (see figure 3B, elements 15 and 19)

7. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Faraone (US Pre Grant Publication 2005/0226281 A1) in view of Hara (US Pre Grant Publication 2001/0015810 A1).

Regarding claim 15, Faraone discloses that the substrate, the elastic material, first reflection device, second reflection device, movable gap, actuation device and detection device (see above paragraphs) but does not specify that the elements are enclosed in a package, where the package has a window region facing the backside of the substrate, and where the window region is adapted to allow electromagnetic radiation to traverse there through.

Hara discloses an integrated tunable sensing apparatus (figure 10) that is enclosed in a package (see figure 31), the package having a window region (element 47) facing the backside of the substrate, the window region being adapted to allow electromagnetic radiation to traverse there through. One of ordinary skill in the art would be motivated to use the package as disclosed by Hara to encase the tunable sensing apparatus disclosed by Faraone as the tunable sensing apparatus elements are fragile elements, thus encasing them in a package will make the apparatus more robust and capable of withstanding external stress.

Regarding claim 16, Hara discloses that the package provides a vacuum (see claim 8) in the tunable cavity.

***Response to Arguments***

Applicant's arguments filed June 25, 2007 have been fully considered but they are not persuasive.

Applicant argues that the Faraone reference fails to teach an apparatus or method wherein incident radiation enters the apparatus through a substrate layer coupled to a tunable cavity resonator that is coupled to a detector. Applicant argues that the Faraone reference does not teach "coupling" of the tunable cavity to both the substrate layer and the detector. The examiner respectfully disagrees. The claim language merely states that the tunable cavity must be "coupled" to the detector and the substrate layer, the claim language does not specify that the tunable cavity must be immediately adjacent to both the substrate and the detector nor does the claim language require a particular ordering of the respective elements. The substrate is coupled to the tunable cavity, and the detector is also coupled to the tunable cavity via the substrate as the detector detects radiation that passes through the tunable cavity and the substrate to reach the detector for detection.

Further, applicant argues that the Faraone reference does not teach incident radiation entering a tunable cavity resonator through a substrate. The examiner respectfully disagrees. The Faraone reference teaches an embodiment where the radiation first impinges on a substrate (see figure 3C, elements 27 and 27' are both transparent substrates on both sides of the cavity (area enclosed by elements 17 and 25)), and then pass through the tunable cavity.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christine Sung whose telephone number is 571-272-2448. The examiner can normally be reached on Monday- Friday 9-5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christine Sung
Examiner
Art Unit 2884

CS

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